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A SURVEY FOR MELAMPSORA LEAF RUSTS ALONG THE COLORADO FRONT RANGE

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INTRODUCTION

The native leaf rusts belonging to the genus Melampsora are commonly seen in the summer and early fall throughout Colorado; however, to our knowledge, there are no descriptive accounts of the host tree species affected and specific rust species in Colorado. A brief note on the incidence of M. albertensis (= M. medusae) is contained in the report by Hartley and Hahn (1920). They mentioned that the disease was common in the Pikes' Peak region, but caused little damage.

To our knowledge, only one other survey has been conducted in Colorado for Melampsora rusts. Dr. Brian Geils, USDA Forest Service, made collections of P. tremuloides (quaking aspen) from more than 20 sites along the Colorado Front Range from Woodland Park to Frazer in August 1992 and found only M. medusae on infected leaves (personal communication). His collections did not include other species of Populus or Salix.

Other recent surveys of Salix species, Arizona willow, (S. arizonica) in Arizona have reported the presence of M. epitea (Fairweather 1993).

In other parts of North America, Europe and Asia, several species of Melampsora are considered as important pathogens of Populus species and their hybrids (Hamelin et al. 1993; Hepting 1971; Hubbes et al. 1983).

Within the last few years, concern over native Melampsora species and the introduced Eurasian poplar leaf rust, Melampsora larici-populina, has developed as hybrid poplar plantations along the Columbia River have become infected (Newcombe and Chastagner 1993a, b). Melampsora larici-populina has subsequently been detected in Oregon, Washington, and California, and quarantines were placed on these sites prohibiting the movement of poplars and potential conifer hosts (Anon 1993). As a result of the detection of M. larici-populina in other western states, we were contacted to be aware of any developing poplar leaf rust problems.

As part of this investigation, we began a general survey of leaf rusts of native Populus and Salix species along the Colorado Front Range during the summer of 1994. In addition, native Populus species and hybrids were sent to investigators at Washington State University, Puyallup by Dr. William Jacobi, Colorado State University, Ft. Collins, Colorado, to determine their relative susceptibility to M. larici-populina and M. medusae formae speciales deltoidae, a native rust.

SURVEY METHODOLOGY

During the summer of 1994, a general reconnaissance and collection of leaves from native Populus and Salix species was made along the Colorado Front Range from Golden to Ft. Collins. Leaves exhibiting heavy urediniospore infection were selected from all Populus and Salix species encountered. The location of each collection was noted as well (Table 1). Representative collections were placed in a plant press for future reference.

Identification of Salix species was based on leaf morphology and location of collection since leaves were collected in the summer and reproductive parts were not present (Reed 1991).

Spores were scraped from the underside of sample leaves, mounted in lacto-phenol-cotton blue medium, and observed under a light microscope at 400X. Identification to species was done by comparing urediniospore descriptions from Ziller (1965, 1974). Measurements of spore length and width were made on 15 or 30 spores and averaged. The presence of bilateral wall thickening was also noted.

SCREENING OF COLORADO POPULUS SPECIES

Thirty to fifty container or bareroot stock of P. tremuloides, P. angustifolia, P. nigra var. italica and P. sargentii var. Siouxland were shipped to Dr. George Newcombe, Department of Plant Pathology, Washington State University, Puyallup, Washington, for screening for resistance to M. larici-populina and M. medusae f.sp. deltoidae. Tests were conducted using detached leaves in Petri dishes under controlled conditions (Anon 1993). Highly susceptible poplar clones from Puyallup, Washington, were included as controls in the test (Table 3).

RESULTS AND DISCUSSION

Urediniospores collected from P. tremuloides, P. sargentii, P. deltoides var. wislizenii and P. angustifolia were determined to be from a single species, M. medusae. A single species of rust, M. epitea, was found on all Salix species examined (Table 2). At this time, the entire complex of Melampsora rusts on Salix species in North America has been grouped under M. epitea (Savile 1953).

The results of the screening test indicated a very high level of resistance of P. tremuloides to both rust species, with narrowleaf cottonwood (P. angustifolia), Siouxland (P. sargentii var. Siouxland) and Lombardy poplars (P. nigra var. italica) moderate to low in resistance (Table 3). It is interesting that the Rocky Mountain sources of P. tremuloides showed resistance to M. medusae. Shain (1988) reported that great diversity occurs in the species of M. medusae which might suggest many biological species. He also reported that urediniospores collected from eastern cottonwood (P. deltoides) did not infect quaking aspen. Thus, the Rocky Mountain sources of P. tremuloides might be more resistant to the Pacific Northwest forms of M. medusae.

As a result of this survey, we do not believe that the introduced rust M. larici-populina is present in the Colorado Populus species populations examined. Continued surveillance and wider collections should be planned for the future since some native Populus species appear to have low to moderate resistance to this rust.

Table 1. Location of Melampsora leaf rust collections, Colorado Front Range, 1994.

Host species	County	Legal description
Quaking aspen *Populus tremuloides*	Boulder	T1S,R73W, Sect.22
Plains cottonwood *P. sargentii*	Larimer	T7N,R71W, Sect.14
Rio Grande cottonwood *P. deltoides* var. *wislizenii*	Larimer	T7N,R71W, Sect.14
Narrowleaf cottonwood *P. angustifolia*	Boulder	T1S,R71W, Sect.8
Peachleaf willow *Salix amygdaloides*	Gilpin	T1S,R72W, Sect.28
Geyer willow *S. geyeriana*	Boulder	T1S,R72W, Sect.28,30
Blue stem willow *S. irrorata*	Boulder	T1S,R73W, Sect.21
Scouler willow *S. scouleriana*	Boulder	T1S,R73W, Sect.22

Table 2. Identification of *Melampsora* species collected along the Colorado Front Range, 1994, based on urediniospore characteristics.

Host species	*Melampsora* spp.	Urediniospore length x width (microns) 1/	Urediniospore bilateral wall thickening (Yes/No)
Quaking aspen	M. medusae	26 x 16	Yes
Plains cottonwood	M. medusae	25 x 18	Yes
Rio Grande cottonwood	M. medusae	28 x 18	Yes
Narrowleaf cottonwood	M. medusae	29 x 18	Yes
Peachleaf willow	M. epitea	20 x 18	No
Geyer willow	M. epitea	20 x 18	No
Bluestem willow	M. epitea	20 x 18	No
Scouler willow	M. epitea	17 x 15	No

1/ Measurement based on the average of 15 spores, except for plains cottonwood, narrowleaf cottonwood and Scouler willow based on 30 spores.

Table 3. Average rust scores[1/] for Colorado Populus species artificially inoculated with Melampsora larici-populina and M. medusae f.sp. deltoidae.

Host species	M. larici-populina	M. medusae f.sp. deltoidae
Quaking aspen	0.00	0.00
Narrowleaf cottonwood	2.23	3.71
Lombardy poplar	2.13	4.25
Siouxland	1.92	3.80
Control (highly susceptible)	4.00[2/]	5.00[3/]

1/ Average score for leaves on a scale of 1 to 5 (resistant to susceptible).
2/ Highly susceptible hybrid poplar clone 47-174 (P. trichocarpa x P. deltoides) from Puyallup, WA.
3/ Highly susceptible poplar clone 1-488 (P. deltoides x P. nigra c.v.) from Puyallup, WA.

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